Christmas Holiday Period Traffic Fatality Estimate, 2009

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Holiday period definition

Christmas is December 25 and it is observed on that day. The length of the holiday period varies depending on what day of the week December 25 falls. It may be 1.25 days long if December 25 falls on a Wednesday; 3.25 days long if December 25 falls on a Friday, Saturday, Sunday, or Monday; or 4.25 days long if December 25 falls on a Tuesday or Thursday.

In 2009, Christmas falls on Friday so the holiday period is 3.25 days and extends from 6:00 p.m. Thursday, December 24, to 11:59 p.m. Sunday, December 27.[1]

Method and results

The objective is to estimate the number of deaths that will occur in traffic crashes during the Christmas holiday period based on data available several weeks before the holiday. The estimate developed here includes all traffic deaths from crashes that occur during the holiday period.[2]

The general procedure involves three steps. First, historical data are used to determine the average fraction holiday fatalities are of total deaths for the month containing the holiday. Second, total traffic deaths for the coming month in which the holiday falls are estimated using a time series forecasting model. Third, the projected total for the month is multiplied by the fraction to obtain the holiday estimate.

Holiday as percent of month. Total December deaths are the estimates published in *Injury Facts*® two years after the year of the estimate. This figure is used, rather than a revised estimate or the National Center for Health Statistics final count, because it closely approximates the level of accuracy that the time series estimate will give for total monthly deaths in the current year. Fatality Analysis Reporting System (FARS) data were used to obtain deaths during the holiday periods.

Table 1 shows the total traffic fatalities for the month of December and fatalities from crashes that occurred during the six most recent 3.25-day Christmas holiday periods. Fatalities from crashes during the Christmas holiday periods averaged 10.95% of the total fatalities in December.

Time series model and projection. A time series model was developed to forecast an estimate of total traffic deaths for December 2009. An Autoregressive Integrated Moving Average (ARIMA) model was constructed based on 48 months of traffic deaths recorded from November 2005 through October 2009. An ARIMA model was chosen because of the seasonal pattern in traffic deaths. The model was developed using the SPSS/PC+ Version 5.0 statistical computer package. The model forecasts total traffic fatalities for December 2009 to be 2,893.

Holiday estimate. Multiplying the projected total fatalities by the fraction obtained in the first step gives an estimate of 317 traffic fatalities from crashes during the holiday period.

Confidence interval

There is uncertainty associated with any estimate. The 90% confidence interval for the estimate of total December deaths is 2,683 to 3,119. If we assume that the fraction of December deaths that occur during the Christmas period is normally distributed, then the 90% confidence interval for that fraction is 9.45% to 12.45%. Combining these two gives the confidence interval for the Christmas period estimate: 253 to 388 traffic deaths.

Nonfatal disabling injuries

Based on the current disabling-injury to death ratio of 53:1, and rounded to the nearest hundred, the estimate of the number of nonfatal disabling injuries that will result from crashes during the holiday period is 16,800 with a range of 13,400 to 20,600.

Holiday comparison

A frequently asked question is "How much more dangerous is travel over the Christmas holiday?" There are two aspects of this question that must be considered. First, compared to what? And, second, what about changes in the amount of driving?

For most holidays, we compare the holiday to periods of similar length before and after it. Because New Year's Day is exactly one week after Christmas, we chose to compare Christmas to periods of similar length one week and two weeks before it. Specifically, from 6:00 p.m. Thursday to 11:59 p.m. Sunday of the two weeks immediately before the Christmas holiday. Table 2 shows the fatality data from FARS for comparable weekends. The average number of traffic deaths during Christmas over those six years was 5.3% *lower* than the average number of traffic deaths during the comparison periods (394 vs. 416 deaths). The difference between these two means is, however, *not* statistically significant.

The second question concerns changes in the amount of travel, or exposure. We know of no data system that tracks changes in vehicle miles of travel by day of the year on a national basis. Lacking an objective measure of exposure change, we assume that travel is greater on holidays than on nonholidays. If this is in fact true, then with greater travel and fewer deaths, the risk of dying in a traffic crash during the Christmas holiday period is less than comparable nonholiday periods.

Arnold and Cerrelli (1987) also examined the variation in fatalities during holiday periods.[3] They used FARS data for 1975-1985 to determine average daily fatalities for each day of the week in each month (e.g., Mondays in December). For the extended Christmas holiday period, they found that fatalities rose 18% on December 21, 29% on December 22, 40% on December 23, and 41% on December 24. Fatalities dropped on December 25-30 to about 15% below normal throughout the week.

Evaluation

Table 3 compares the actual FARS counts with the Council's estimates for all holidays for which data are available. Seventy-one of the 83 actual counts fall within the 90% confidence interval of the estimate.

Notes

1.   The National Highway Traffic Safety Administration extends the holiday period to 5:59 a.m. the following morning in its published tabulations of holiday deaths.

2.   This differs from holiday estimates published by the Council in 1991 and earlier years. Comparisons should *not* be made between the holiday data and estimates shown here and holiday data and estimates published in 1991 and earlier years.

3.   Arnold, R., & Cerrelli, E.C. (1987). *Holiday Effect on Traffic Fatalities*. DOT HS 807 115. Springfield, VA: National Technical Information Service.

Table 1. Traffic Deaths During 3.25-Day Christmas Periods as a Percent of Total December Traffic Deaths.

YEAR	DECEMBER	CHRISTMAS PERIOD	PERCENT
1998	3,340	354	10.60
1999	3,210	456	14.21
2000	3,560	419	11.77
2004	4,000	370	9.25
2005	3,980	383	9.62
2006	3,700	379	10.24
6-year avg.	*3,632*	*394*	*10.95*

Source: *Injury Facts*®*, Accident Facts*® and FARS.

Table 2. Traffic Deaths During 3.25-Day Christmas Periods and Equivalent Nonholiday Periods.

YEAR	CHRISTMAS PERIOD	EQUIVALENT PERIODS	
		1 WEEK BEFORE	2 WEEKS BEFORE
1998	354	408	502
1999	456	402	393
2000	419	420	389
2004	370	447	412
2005	383	400	399
2006	379	410	414
6-year avg.	*394*	*416*	

Source: FARS.

Table 3. Holiday Estimate Evaluation

YEAR	ESTIMATE	90% C. I.	ACTUAL	YEAR	ESTIMATE	90% C. I.	ACTUAL
New Year's Day				Labor Day			
1995		(no estimate)		1995..................	512	457 – 574	490
1996	392	331 – 461	414	1996..................	544	494 – 598	508
1997	184	124 – 254	176	1997..................	492	426 – 566	485
1998	514	453 – 581	532	1998..................	498	447 – 554	447
1999	391	348 – 439	349	1999..................	468	422 – 518	469
2000	364	322 – 411	* 458	2000..................	481	430 – 538	514
2001	399	359 – 443	* 338	2001..................	474	420 – 533	432
2002	533	467 – 608	554	2002..................	474	413 – 542	536
2003	184	140 – 235	203	2003..................	488	429 – 555	490
2004	524	450 – 609	549	2004..................	486	421 – 558	480
2005	392	338 – 453	449	2005..................	475	420 – 537	500
2006	399	347 – 457	432	2006..................	533	477 – 595	487
2007	405	354 – 463	387	2007..................	490	440 – 544	508
2008	498	447 – 555	* 407	2008..................	439	384 – 501	473
Memorial Day				Thanksgiving Day			
1995	456	381 – 543	471	1995..................	527	465 – 596	519
1996	478	411 – 552	494	1996..................	528	465 – 597	570
1997	473	408 – 546	498	1997..................	541	480 – 609	554
1998	470	419 – 528	* 383	1998..................	541	485 – 603	586
1999	470	414 – 534	494	1999..................	500	441 – 566	* 567
2000	461	404 – 525	451	2000..................	497	432 – 570	497
2001	468	419 – 523	499	2001..................	532	455 – 619	580
2002	498	423 – 582	484	2002..................	575	493 – 667	527
2003	464	396 – 542	472	2003..................	544	459 – 642	544
2004	476	409 – 551	496	2004..................	556	476 – 646	556
2005	471	410 – 540	512	2005..................	610	505 – 735	605
2006	541	487 – 601	493	2006..................	555	500 – 615	* 623
2007	497	450 – 548	475	2007..................	564	499 – 635	542
2008	468	420 – 520	* 414	2008..................	479	415 – 551	484
Independence Day				Christmas Day			
1995	636	553 – 731	631	1995..................	422	351 – 502	* 342
1996	653	580 – 734	609	1996..................	145	113 – 182	136
1997	469	411 – 535	492	1997..................	563	458 – 680	466
1998	498	448 – 552	458	1998..................	406	350 – 468	354
1999	503	446 – 567	499	1999..................	369	316 – 428	* 456
2000	645	578 – 719	683	2000..................	359	300 – 424	419
2001	198	144 – 260	173	2001..................	522	417 – 641	575
2002	648	565 – 743	662	2002..................	160	131 – 193	* 114
2003	520	449 – 602	500	2003..................	529	438 – 636	488
2004	522	451 – 602	502	2004..................	440	356 – 536	370
2005	498	444 – 557	* 565	2005..................	443	352 – 546	383
2006	751	680 – 828	* 629	2006..................	415	332 – 507	379
2007	203	160 – 251	184	2007..................	497	424 – 579	454
2008	449	396 – 507	472	2008..................	432	371 – 500	409

Source: Estimates from National Safety Council; actual counts from FARS.
* = outside of 90% confidence interval.